

# Electronic data interchange in hospital materiel management

**Wai K. Law, Ph.D.**  
*Assistant Professor*

**Homer Ooten, Ph.D.**  
*Assistant Professor*  
*Florida State University*  
*Tallahassee, Florida*

**E**LECTRONIC DATA interchange (EDI) is one of the latest trends in hospital materiel management. Although a relatively new practice in hospital materiel management, EDI has been successfully implemented in other industries for more than two decades.

The recent adoption of the American National Standards Institute (ANSI) X.12 standard by the Health Industry Business Communications Council was a giant step toward EDI implementation in the health care industry. According to the Chicago-based American Hospital Association, 6% of U.S. hospitals planned or expanded EDI implementation in 1986. Three years later, in 1989, 47% of U.S. hospitals endorsed EDI implementation.<sup>1</sup>

EDI involves computer-to-computer exchange of business data and documents. One type of EDI system familiar to materiel management is the electronic order entry (EOE) system. EDI is more than a system, technology, or product, however.

*Hosp Materiel Manage Q*, 1992, 14(1), 46-53  
© 1992 Aspen Publishers, Inc.

EDI is a business management methodology that encourages information exchanges among every department in a health care delivery organization. Establishment of EDI linkages with business partners improves communication. The results are improved delivery services from vendors and lower costs for the hospital from reduced inventory levels.<sup>2</sup>

EDI promotes compatibility between functional departments and trade partners. It facilitates information exchange without paper, mail, facsimile, or teletype machines.<sup>1,3</sup> The benefits include reduction of paperwork and greater speed of communication. Computer-to-computer linkages also permit the transmission of large volumes of information at high speed and relatively low cost. As a result, more information can be made available to decision makers.

When EDI is applied in order entry, greater accuracy of order information is achieved because the transmitted information does not have to be reentered into computer systems. The elimination of duplicated data entry activities allows better allocations of resources and hence greater productivity.

#### **EDI IN MATERIEL MANAGEMENT**

The implementation of EDI probably occurs in several stages. EOE systems are usually the first EDI implementation for materiel management. EOE relieves the buyer of the responsibility of preparing purchase orders. The buyer can then be given other responsibilities, such as controlling inventory dispersement and delivery schedules as well as taking time to improve customer services by spending time with the users within the hospital.

Other EDI applications include invoicing and fund transfers, price quotes, packing lists, networking with other hospitals and medical facilities, and in-group purchasing.<sup>1,4,5</sup> The philosophy of EDI application is to make current information available to multiple parties in the most accurate and efficient way. For example, materiel management needs to communicate to finance on price changes, vendor records, order status, and payment authorizations.<sup>6</sup> On the other hand, materiel management should be informed concerning the budgets of various departments to take advantage of volume purchase opportunities.

These are just some potentials for EDI application in hospital materiel management. The research project described below was conducted to gain more insight into the current and projected application of EDI in hospital materiel management. We report findings on the application of electronic data linkages among hospitals.

#### **SURVEY DESCRIPTION**

A comprehensive survey was sent to materiel managers in 400 health service organizations in the states of Florida, Alabama, and Georgia. The sample was randomly selected from the directory of hospitals published by the American Hospital Association. A total of 117 usable responses were received; this represented an overall return

---

*A comprehensive survey was sent to materiel managers in 400 health service organizations in the states of Florida, Alabama, and Georgia.*

---

rate of 29.25%. Table 1 presents a summary of the respondent profiles.

Forty percent of the 117 responding hospitals were publicly owned facilities, 30% were privately owned nonprofit organizations, and 28% were for-profit private hospitals. Two respondents failed to provide ownership information. The number of available patient beds was used as a measurement of hospital size; 28% of the respondents had fewer than 150 beds, 34% had 151 to 300 beds, 21% had 301 to 500 beds, and 17% had more than 500 beds. Forty-nine percent of the respondents reported membership in a multihospital group.

A majority of the respondents were materiel management professionals, with titles ranging from purchasing agent, to manager, to director, to vice president. Two individuals held the title Director of Health Services. The respondents had an average of 7.3 years of experience in their present job. Eight percent had more than 20 years of experience in the current position. The number of employees supervised by the individual respondent could be an indication of the size of the materiel function. The median supervisory responsibility was approximately 10 persons.

## FINDINGS

### Types of computer linkages

The respondents were asked to report the current implementation of various types of computer-to-computer linkages in their hospitals and their projection of future implementation of such linkages within the next 5 years (Table 2).

More than 50% of the respondents reported existing computer linkages to suppliers. Although it is not surprising for supplier

**Table 1.** Survey respondent profiles (N = 117)

Feature	Number (%) of respondents
<i>Hospitals</i>	
Size (by number of beds)	
<150	33 (28.2)
151-300	40 (34.2)
301-500	24 (20.5)
>500	20 (17.1)
Ownership	
Government	47 (40.2)
Private nonprofit	35 (29.9)
Private for-profit	33 (28.2)
Unreported	2 (1.7)
Location	
Florida	79 (67.5)
Georgia	21 (18.0)
Alabama	17 (14.5)
Multihospital group membership	
Member	57 (48.7)
Nonmember	54 (46.2)
Unreported	6 (5.1)
<i>Materiel manager titles</i>	
Director of Materiel Management	
81	(69.2)
Purchasing Director	
12	(10.3)
Assistant Materiel Manager	
11	(9.4)
Purchasing Agent	
10	(8.5)
Director of Health Services	
2	(1.7)
Vice President	
1	(0.9)
<i>Size of materiel function (number of employees supervised)</i>	
None	7 (6.0)
1-5	26 (22.2)
6-10	25 (21.4)
11-20	24 (20.5)
21-50	16 (13.7)
51-100	16 (13.7)
101-130	3 (2.5)

**Table 2.** Frequency of reported current/expected EDI linkages

Type of linkage	Existing (%) (N = 117)	In 5 years (%) (N = 117)
Suppliers (MRO)	90 (77)	103 (88)
Suppliers (capital equipment)	60 (51)	75 (64)
Library	25 (21)	47 (40)
Financial institutions	13 (11)	53 (45)
Other hospitals	11 (9)	52 (44)
Research laboratories	5 (4)	29 (25)
Other databases*	21 (18)	38 (33)
Others*	9 (8)	11 (9)

\*There were eight groups of linkages reported under these two categories.

linkages to be the most frequently cited computer linkage, the strong projected linkages with libraries, financial institutions, and other hospitals in the near future suggest a trend toward the adoption of advanced communication technology and paperless transaction in the overall operations of hospitals.

The respondents were encouraged to indicate other computer linkages not explicitly listed in the survey. Eight groups of computer linkages were reported, including purchasing groups, corporate database, patient billing, counseling agency, insurance company, and electronic mail or bulletin board (Table 3). This is consistent with the overall findings that materiel procurement was the primary area of application for EDI. Financial transactions and general information sourcing were the other two leading potential applications of computer linkages.

#### Leading users of EDI

An examination of EDI applications under various hospital ownerships indicated that the private, nonprofit hospitals seemed to be the leaders in implementation of com-

puter linkages. This group of hospitals reported the highest current or projected implementation of all types of computer linkages except for linkages to suppliers of capital equipment (Table 4).

The for-profit hospitals reported strong application of computer linkages, especially with suppliers. This group of hospitals, however, showed little interest in further expansion of non-supplier-related electronic linkages except for connections between hospitals. The latter seems to be a logical

**Table 3.** Reported other computer linkages

Type of linkage	Frequency
Coop buying groups	10
Corporate database	8
Accounts payable	6
Voluntary Hospitals of America (VHA)	5
Counseling agency	3
Insurance company (Blue Cross/Blue Shield)	2
Electronic mail	2
Bulletin board	1

**Table 4.** Hospital ownership and percentage of EDI usage

Type of linkage	Government (N= 47)		Private for-profit (N= 33)		Private nonprofit (N= 35)	
	p	f	p	f	p	f
Suppliers (MRO)	64	85	82	88	91	94
Suppliers (capital equipment)	45	62	64	76	49	57
Library	19	34	12	18	34	69
Financial institutions	11	45	6	24	17	69
Other hospitals	11	38	6	45	11	54
Research laboratories	2	19	12	18	0	40
Other databases*	15	34	27	36	14	29
Others*	9	11	12	15	3	3

p, Percentage reporting existing computer linkages.

f, Percentage projecting computer linkages in 5 years.

\* There were eight groups of linkages reported under these two categories.

step in EDI implementation because 91% of the for-profit hospitals participating in this survey belonged to a multihospital group.

Government-owned hospitals, although lagging behind private hospitals in implementation of computer linkages, were showing interest in pursuing advanced communication technology.

Taking another perspective on the phenomenon, the high initial costs of EDI implementation have been reported as the leading barrier to EDI usage.<sup>3</sup> One might expect the larger hospitals to be financially more capable of investing in computerized communications systems. Survey data as shown in Table 5, however, indicated that medium-size hospitals with between 151 to 300 beds were the leading current users of EDI linkages, although in the long term the larger hospitals with more than 500 beds are expected to take the lead in implementation of computer linkages.

### Management support for EDI implementation

EDI implementation is a strategic investment for productivity improvement. The usually high start-up costs require strong top management support. Thus access to top management could play an important role in the adoption of computer communications technology. Table 6 indicates higher reported levels of EDI implementation for those directly supervised by top management, especially for supplier computer linkages. Top management seemed to have less influence on other types of linkages, possibly because of the lesser expense involved in establishing the other types of linkages.

### Optimism regarding expanded EDI applications

A closer examination of the survey responses shows large gaps between current

**Table 5.** Hospital size and percentage of EDI usage

Type of linkage	Number of beds							
	<150 (N= 33)		151-300 (N= 40)		301-500 (N= 24)		>500 (N= 20)	
	p	f	p	f	p	f	p	f
Suppliers	64	79	85	88	75	92	85	100
Suppliers (capital equipment)	42	64	58	60	50	63	55	75
Library	9	27	18	40	25	33	45	65
Financial institutions	6	33	18	48	13	50	5	55
Other hospitals	9	30	8	48	4	42	20	65
Research laboratories	0	21	13	35	0	4	0	35
Other databases*	12	27	20	38	13	21	30	45
Others*	0	3	10	10	17	21	5	5

p, Percentage reporting existing computer linkages.

f, Percentage projecting computer linkages in 5 years.

\* There were eight groups of linkages reported under these two categories.

**Table 6.** Rank of management superior and percentage of EDI usage

Type of linkage	Chief Executive Officer (N= 12)		Chief Financial Officer (N= 44)		Vice President (N= 31)		Director of Materiel Management (N = 21)		Administrator (N= 9)	
	p	f	p	f	p	f	p	f	p	f
	Suppliers (MRO)	83	92	82	91	81	90	71	90	44
Suppliers (capital equipment)	58	75	55	68	48	61	52	62	33	44
Library	8	17	25	41	29	52	19	38	0	22
Financial institutions	8	25	16	43	10	55	5	52	11	33
Other hospitals	8	67	5	30	10	55	14	57	22	22
Research laboratories	8	17	7	23	0	26	5	33	0	22
Other databases*	8	8	27	43	13	26	14	43	11	11
Others*	8	8	11	11	3	7	10	14	0	0

p, Percentage reporting existing computer linkages.

f, Percentage projecting computer linkages in 5 years.

\* There were eight groups of linkages reported under these two categories.

and projected implementation of certain types of computer linkages. Because the respondents were not required to consider explicitly the financial feasibility of establishing such linkages, the projected figures could deviate from the reality of future implementations.

Generally speaking, the purchasing agents and purchasing directors were more optimistic about future expansion of computer linkages. Materiel managers and directors tended to be more conservative in their projections. There was better consensus on the expansion of computer linkages to financial institutions, other hospitals, and research laboratories (Table 7).

• • •

The survey findings reported here support the continued trend toward increasing application of computer linkages in hospital

operations. A majority of the hospitals surveyed already had some sort of computer linkages with their suppliers, possibly an EOE system. There were strong indications of expanding computer linkages to other health care institutions, financial institutions, business partners (i.e., insurance companies), purchasing groups, supporting agencies (i.e., libraries, research laboratories, and counseling agencies), electronic mail, and patient billing.

Private hospitals, especially nonprofit hospitals, were more aggressive in the implementation of computer linkages. The initial costs of electronic linkage systems seemed to be affordable, or well justified, as indicated by the relatively large number of medium-size hospitals already linked electronically to other institutions.

Top management attention was positively related to the implementation of computer

**Table 7.** Hospital size and percentage of EDI usage

Type of linkage	Purchasing Agent (N=10)		Purchasing Director (N=12)		Assistant Materiel Manager (N=11)		Director of Materiel Management (N=81)	
	p	f	p	f	p	f	p	f
Suppliers (MRO)	70	100	50	83	82	82	81	89
Suppliers (capital equipment)	40	60	25	33	64	73	56	68
Library	0	40	8	25	36	36	25	43
Financial institutions	20	70	25	67	0	27	10	43
Other hospitals	40	70	17	33	0	36	6	44
Research laboratories	0	40	0	17	9	27	5	25
Other databases*	2	2	0	2	2	5	14	23
Others*	0	0	1	1	1	2	6	7

p, Percentage reporting existing computer linkages.

f, Percentage projecting computer linkages in 5 years.

\* There were eight groups of linkages reported under these two categories.



linkages to suppliers but played a lesser role in establishing other types of linkages.

The overall optimism concerning future

expansion of computer linkages suggests an increasingly important role for electronic linkages in materiel management.

## REFERENCES

---

1. "Electronic Document Delivery: The Choices and What it all Means," *Purchasing* 101 (August 1986): 44-46.
2. Ferguson, Daniel M., Hill, Ned C. and Hansen, James V. "Electronic Data Interchange: Foundations and Survey Evidence on Current Use," *Journal of Information Systems* 4 (Spring 1990): 81-91.
3. Hoffhine, Charles E. "Financial Trends Bringing Finance and Materiel Management Together," *Hospital Materiel Management Quarterly* 9 (1987): 28-34.
4. Housely, Charles E. "Building a Competitive Advantage," *Hospital Materiel Management Quarterly* 9 (1987): 19-28.
5. Pitts, William. "Fax Versus Computers in a Health Care Setting," *Hospital Materiel Management Quarterly* 11 (1989): 5-10.
6. Sector, Paula M. "EDI: Key Competitive Edge for Materials Purchasing," *Health Facilities Management* 3 (June 1990): 44-53.